



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
07.08.2019 Bulletin 2019/32

(51) Int Cl.:
A47B 21/06 (2006.01)

(21) Application number: **19153958.4**

(22) Date of filing: **28.01.2019**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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(30) Priority: **31.01.2018 FI 20185088**

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(54) **SYSTEM FOR WORK DESK ELECTRIFICATION**

(57) A modular unit (300) for work desk electrification comprises an inlet (302) for providing electricity into the modular unit and at least one interface (310, 312) such as a socket for providing electricity to appliances. The modular unit further comprises an outlet (304) for distrib-

uting electricity from the modular unit into other modular units. The modular unit, together with the inlet and the outlet, is adapted for modular connectivity with at least two like modular units using electric cables adapted for pluggable connection with the inlet and the outlet.

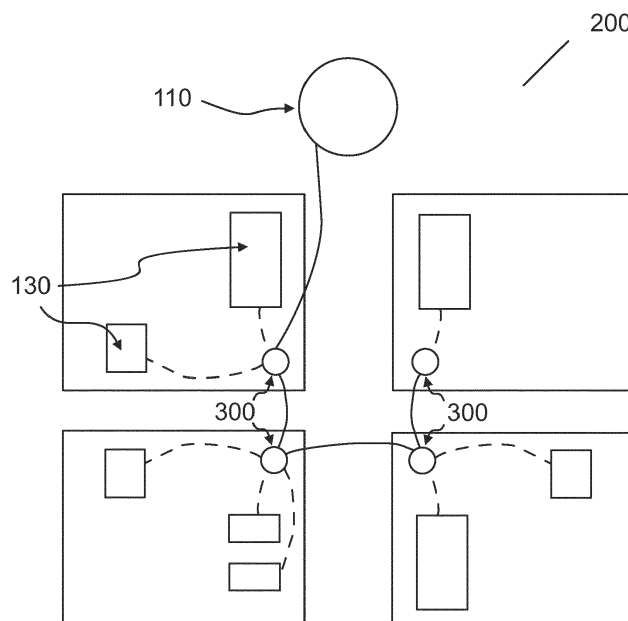


FIG. 2

Description

FIELD

[0001] The present disclosure relates to work desk electrification, i.e. providing work desks with electric sockets for appliances.

BACKGROUND

[0002] Electric appliances such as desktop computers and mobile devices are commonly used at work desks. To provide the electricity required for operation or charging of these devices, various solutions involving electric sockets are used. It is typical, particularly in an office environment, for a multitude of such electrical sockets to be required and it may often be preferred to install one per work desk so that electricity is readily available at the desk.

[0003] In the prior art, as demonstrated in Fig. 1, a common solution 100 is to use a single apparatus 110 such as a socket tower connected to mains electricity. The socket tower has multiple Schuko sockets to which individual extension apparatuses 120 may be connected to deliver electricity to multiple work desks or posts. The extension apparatuses 120 at each work post may then comprise sockets such as Schuko sockets of their allowing appliances 130 to be connected to them for electricity. This way of providing electrification requires long cables when used in a typical office environment having several work desks. Additionally, it easily results in cable clutter which may necessitate use of separate cable management devices such as cable ducts.

SUMMARY

[0004] An objective is to eliminate or alleviate at least some of the disadvantages mentioned above.

[0005] In particular, it is an objective to provide a modular unit and method for work desk electrification.

[0006] According to an aspect, a modular unit for work desk electrification comprises an inlet for providing electricity into the modular unit and at least one interface such as a socket for providing electricity to appliances. This interface may also be a charging interface. The modular unit further comprises an outlet for distributing electricity from the modular unit into other modular units. The modular unit, together with the inlet and the outlet, is adapted for modular connectivity with at least two like modular units using electric cables adapted for pluggable connection with the inlet and the outlet. The electric cables can be prefabricated so that they are suitable and ready for pluggable connectivity with the modular unit. It is enough for the modular unit to have a single inlet and a single outlet so that it can be connected modularly into a chain with like modular units. Using no more than one inlet and one outlet allows compact size for the modular unit. However, the modular unit may also be arranged to comprise

more than one inlet and/or outlet to provide further alternatives for branching the modular system.

[0007] The modular connectivity allows connecting the modular unit to mains electricity indirectly through one or more like units. At the same time, the interface for providing electricity allows the modular unit to function as a charging device and a power source for appliances such as desktop computer or mobile electronic devices including laptop computers, tablets and mobile phones. Use of modular units allows quick installation and the possibility to arrange the units in a chain. The modular units are adapted to together form a framed system, which may be for example an installation coupler framed system (in Finnish: "pistoliitinrunkojärjestelmä"). This can be considered as a fixed installation which allows for a qualified electrician to form the system by combining the modular units when the system is not connected into a power source. Under current regulations, once the system has been thus prepared and inspected by a qualified electrician, it is then allowable for any person to connect the system to mains electricity, for example by plugging a cable with a plugin connector at one end of the system into a Schuko socket.

[0008] As exemplified above, for a piece of equipment to be suitable for work desk electrification typically requires the construction of the equipment to fulfill various requirements pertaining to the operation of the equipment and the safety thereof. The requirements can be included in industry standards and, for their part, define the structure of the equipment that is applicable for work desk electrification. This can mean, for example, that the equipment, which here is the modular unit, comprises mechanisms such as a locking mechanism shielding them from contact by the user to prevent the user from tampering with the equipment. This allows the equipment is thereby proofed so that it cannot be opened by hand without a tool. As the equipment for work desk electrification are often deployed in settings where the person using the work desk and the equipment is not involved in the installation or maintenance of the equipment, such structural safety features of the equipment for work desk electrification are typically not pernicious to the end user.

[0009] The disclosure specifically allows the system for work desk electrification to be formed using modular units adapted for installation into furniture including work desks or desktops. The modular units function as branching points removing the need for separate hubs. The cables connecting the modular units may be routed under desktops or even in a technical space under the floor on which the work desks are located.

[0010] In an embodiment, the inlet and the outlet are arranged as installation coupler interfaces. Using installation couplers in the cables together with the inlet and the outlet allows quick and reliable plug-in connectivity suitable for forming a framed system from the modular units as disclosed. The installation coupler interface may be adapted to conform to standard EN IEC 61535.

[0011] In an embodiment, the inlet and outlet are con-

nected in parallel within the modular unit. This allows the voltage and the frequency at the outlet to match the voltage and the frequency at the inlet. In a similar fashion, any load within the modular unit comprising the interface for providing electricity to appliances may be connected in parallel with the inlet and the outlet. In a simple implementation, the inlet may comprise two, three or five poles which are connected to the corresponding poles at the outlet.

[0012] In an embodiment, the at least one interface comprises a USB (Universal Serial Bus) socket and/or a Schuko socket. Depending on the socket type, this allows the modular unit to function as a charging device for appliances compatible with USB or Schuko contacts.

[0013] In an embodiment, the at least one interface comprises a Schuko socket or a USB socket arranged to face in the longitudinal direction of the modular unit or a USB socket arranged to face perpendicularly with respect to the longitudinal direction of the modular unit. In the former case, the sockets may then face perpendicularly with respect to a desktop surface when the modular unit is installed on a desktop. In the latter case, the USB socket may thus face substantially along the plane of a desktop when the modular unit is installed on the desktop. These configurations allow ease of use specifically for a desktop installation of the modular unit.

[0014] In an embodiment, the modular unit is adapted for attachment on a desktop from above. This allows the modular unit to be installed on a stationary desk or desktop, thus removing the need to turn the desktop around during installation which may notably speed up and simplify the process. For this purpose, the modular unit may comprise a removable cover. It may additionally comprise means possibly including pre-made holes for screwing or otherwise fastening the modular unit to the desktop from above.

[0015] In an embodiment, the modular unit comprises an enclosure housing the at least one interface, e.g. in a head of the enclosure. The enclosure may further comprise a bottom housing the inlet and the outlet. The modular unit may be arranged for the head to be abutted on a desktop while the bottom is positioned below the desktop. This allows reducing the volume the modular unit takes on the desktop as most of the electronics and connections of the unit may be arranged below the desktop level. Additionally, this allows arranging the cables connecting the modular units also below the desktop level.

[0016] In an embodiment, the modular unit comprises a head and/or bottom having a circular cross section. This allows the modular unit to be installed into a circular bore, such as a through-hole on a desktop, which may be prefabricated or bored on-site. This may notably simplify installation of the modular unit as boring equipment is readily available and the circumference of the modular unit may be arranged to conform to standard bore-head circumferences to allow tight fit.

[0017] In an embodiment, the modular unit houses a circuit board arranged along the longitudinal direction of

the modular unit. Circuit boards, used for example to provide a USB socket for the interface for providing electricity to appliances, may take a notable amount of space in two dimensions and therefore installing them vertically with the modular unit may notably allow reduction in the size of the modular unit on the desktop. In particular, this allows a compact construction for a modular unit having USB sockets as a sole interface for providing electricity to appliances.

[0018] In an embodiment, the modular unit comprises a first enclosure housing the at least one interface, a second enclosure housing the inlet and the outlet and an electric cable situated between the first and the second enclosure. The electric cable electrically connects the inlet and the outlet to the circuitry within the first enclosure including the at least one interface and it may additionally be arranged to support the second enclosure. Separating the modular unit into two enclosures allows the size of the first enclosure housing at least one interface to be reduced. In particular, reducing the circumference of the first enclosure or a bottom part of the first enclosure allows the modular unit to fit into a hole with reduced diameter. This may be applied, for example, for modular units having USB sockets as a sole interface for providing electricity to appliances

[0019] In an aspect, a desktop comprises one or more modular units. The desktop may comprise a hole, including a through-hole, or a mounting adapted for the modular unit.

[0020] In an aspect, one or more modular units are used for work desk electrification. Two, three or more modular units may thereby be connected in a chain. The one or more modular units may be installed to one or more work desks, for example on the desktops. The modular units may be attached to the work desks for example by screws. In many cases, it may suffice to use a single modular unit for each work desk or a work post, when the desk comprises multiple work posts. Using the modular units for work desk electrification allows providing electrical contact points for appliances on a piece of furniture in a compact, flexible and extendable manner. Additionally, cable control may be improved, specifically in comparison to a situation where separate electrification points are provided at each desk.

[0021] In an aspect, a system for work desk electrification comprises two or more modular units and one or more electric cables connecting the two or more modular units in a chain formation. The system may be connected to mains electricity, for example by a Schuko plug. In a system with at least three modular units connected in chain formation, at least one modular unit is connected to two other modular units. In principle, the number of modular units may be increased without a limit so that chains having up to 10 or even up to 50 modular units could well be realized. While some or all of the modular units may be installed at work desks, e.g. on desktops, it is also possible to install at least some of the modular units along the chain in different locations, e.g. on other

pieces of furniture.

[0022] In an aspect, a method for work desk electrification comprises installing two or more modular units to one or more work desks and connecting the two or more modular units in a chain formation using one or more electric cables. The electric cables can be prefabricated for plug-in connectivity, for example having installation coupler interfaces.

[0023] It is to be understood that the aspects and embodiments described above may be used in any combination with each other. Several of the aspects and embodiments may be combined together to form a further embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] The accompanying drawings, which are included to provide a further understanding and constitute a part of this specification, illustrate embodiments and together with the description help to explain the principles of the invention. In the drawings:

Fig. 1 schematically illustrates a system for work desk electrification according to prior art.

Fig. 2 schematically illustrates a system for work desk electrification according to an embodiment.

Figs. 3a-d illustrate a modular unit according to an embodiment from different views.

Fig. 4a illustrates a modular unit according to another embodiment from a perspective view.

Figs. 4b-c illustrate an enclosure according to an embodiment.

Figs. 5a-b illustrate modular units according to embodiments.

Fig. 6 illustrates a piece of furniture with a modular unit installed therein according to an embodiment.

[0025] Like references are used to designate equivalent or at least functionally equivalent parts in the accompanying drawings.

DETAILED DESCRIPTION

[0026] The detailed description provided below in connection with the appended drawings is intended as a description of the embodiments and is not intended to represent the only forms in which the embodiment may be constructed or utilized. However, the same or equivalent functions and structures may be accomplished by different embodiments.

[0027] Figure 2 shows a schematic diagram of a system 200 for work desk electrification according to an em-

bodiment. The system 200 comprises one or more modular units 300 connected to each other by electric cables (illustrated as solid lines between the units). In the illustrated embodiment, the modular units are installed on pieces of furniture such as work desks, tables, boards, panels or shelves. The modular units 130 may further be used to distribute electricity to appliances 130 such as computers, mobile electronic devices, desktop illumination devices or any desktop electric appliances. The modular units 300 may be connected to the appliances 130 by electric cables (illustrated in dashed lines) which may be the standard prefabricated or integrated cables of the appliances 130. The cables connecting the modular units 300 may be installed below the surface of the furniture, e.g. below desktops or, at least partially, in a technical space below the floor on which the furniture is located.

[0028] The modular units 300 may be connected in a chain formation so that each modular unit 300 apart from the first and the last in the chain is connected to exactly two other modular units 300. The number of modular units 300 in the chain may, in principle, be extended without limit so that there are, for example from three to thirty modular units in a chain. In an embodiment, some or all modular units 300 may be adapted to be connectable to more than two other modular units 300, in which case the modular units may be connected in different tree- or mesh-formations.

[0029] The modular units 300 are connected together to form a framed system. The system may be powered from an external power source 110 such as mains electricity. The external power source 110 may be an alternating current (AC) power source. In practice, the connection point of the external power source 110 may be an electric outlet such as a Schuko socket or a socket tower. The system of modular units 300 may be formed by connecting the modular units together when they are not connected to the external power source 110. Once the system has been inspected for compliance with local regulations, it can then quickly and easily be connected to the external power source 110 by plugging a cable from one of the modular units 300 to the connection point of the external power source 110. The framed system thus forms an ensemble for electricity distribution wherein power can be delivered, for example through a socket connection, and from which power can be distributed through the interfaces of individual modular units 300. Each modular unit 300 in the system may therefore be adapted to function both as a electricity distribution unit for other modular units 300 in the system and as an electricity provider for appliances 130.

[0030] The cables between the modular units may be prefabricated and they may include pre-installed connectors adapted for the modular units 300. The cables may therefore be quickly connected and/or disconnected to the modular units 300 with pluggable connectivity. For this purpose, installation couplers may be used and the framed system may be formed as an installation coupler framed system. For example in the case when the system

is adapted for using alternating current, the cables may comprise several wires, e.g. two, three or five wires, including neutral wire and one wire for single-phase current or three-wires for three-phase current. Optionally, a wire for protective earth may be included as well. Correspondingly, the modular units 300 and the connectors are adapted for the number of wires. The connectors of the cable may be similar at both ends of the cable or they may be different. The connectors may be, for example, male and/or female connectors. The cable connecting a modular unit 300, e.g. at the end of a chain, to an external power source may have a connector adapted for the external power source at one end and a connector, such as an installation coupler interface, adapted for the modular units 300 at the other end.

[0031] Figures 3a-d illustrate a modular unit 300 according to an embodiment from different views. Figure 3a corresponds to a perspective view from an up-front angle of a modular unit 300 housed in a single enclosure.

[0032] The enclosure comprises a head 320 and a bottom 330 arranged along the longitudinal direction of the modular unit 300. The head 320 may be adapted to abut on a piece of furniture to which the modular unit 300 is installed. The bottom 330 may be arranged to extend below the surface of the piece of furniture. The perimeter of the head 320 may be larger than the perimeter of the bottom 330. The head 320 and the bottom 330, at least in part, may together form a monolithic piece. The modular unit 300 comprises one or more interfaces 310, 312 for providing electricity to appliances, which interfaces may be housed in the head 320 and/or the bottom 330. The one or more interfaces may comprise socket outlets such as Schuko socket outlets or Universal Serial Bus (USB) socket outlets. Some or all of these may be housed in the head 320 so that the head 320 may serve as a contact point for pluggable connectors. The modular unit 300 may also comprise an interface for wireless charging which may be included in the head 320 or in the bottom 330.

[0033] The bottom 330 may be constructed in a single part but it may also be constructed in two or more separate parts 332, 334 to allow the bottom to be opened. In this case, the upper part 332 may still form a monolithic piece together with the head 320. The bottom 330 may have a circular cross-section. It may be substantially tubular or frusto-conical along the whole or part of its length. The diameter of the bottom 330 may be, for example 50-90 millimeters or 80 millimeters plus/minus 0-5 millimeters to allow the necessary circuitry to be included within while avoiding excess empty space. The bottom 330 may comprise openings 336 for ventilation, for example formed as one or more slits in the longitudinal direction of the modular unit 300 (as illustrated). The inside of the bottom 330 (not illustrated) may comprise one or more support structures for the circuitry installed therein such as one or more rails, for example in the longitudinal direction, for supporting one or more circuit boards, such as USB circuit boards, installed therein.

[0034] The head 320 may also be conical or frusto-conical along the whole or part of its length. The head 320 may be shorter than the bottom 330 as the head 320 may be arranged to primarily house interfaces 310, 312 for providing electricity, whereas the circuitry and wiring required may be housed in the bottom 330. For this purpose, the length of the head 320 may be, for example, one millimeter or more in the longitudinal direction. The length may be increased to allow interfaces to be housed on the side walls of the head 320. To allow one or more USB interfaces to be housed on the side walls next to each other, the length may be for example 1-3 centimeters. The construction also allows installing more than one socket along the longitudinal direction, wherein the length of the head 320 is to be adjusted accordingly. Depending on the application, the length can be kept below five or ten centimeters to avoid the modular unit 300 extending in an overly bulky fashion from the piece of furniture on which it is installed. The head 320 may comprise a cover 322 which may be removable, for example by being adapted for pluggable attachment and removal. The cover 322 may be removed for attaching the modular unit 300 to a piece of furniture. This allows the modular unit 300 to be attached through the head 320, for example by screws, while keeping the exposed outer surface of the modular unit 300 intact. Top of the head 320 may be inclined so that there side of the head 320 is longer on one side than on another side. For example, a first side such as the front side of the head 320 may be arranged to accommodate one or more interfaces for providing electricity to appliances, e.g. sockets such as USB sockets 312. Another side of the head 320, for example the back side of the head may then be dimensioned smaller than the space required to accommodate the one or more interfaces.

[0035] Any parts of the housing of the modular unit 300 can be made in one piece or in two or more pieces, including the head 320 and/or the bottom 332. The two or more pieces may be fastened to each other for example by separate fasteners such as screws or by a snap-on mechanism. Specifically for the latter purpose, the two or more pieces including the head 320 and/or the bottom 330 may be made of flexible material.

[0036] An interface such as a socket or a socket outlet 310, 312 (herein simply "socket") may be arranged to face in the longitudinal direction or in the plane perpendicular to the longitudinal direction. Arranging one or more Schuko sockets 310 to face in the longitudinal direction allows compact form for the modular unit 300. As illustrated, a very compact arrangement can be obtained in a modular unit 300 comprising exactly one Schuko socket, which may be located substantially on the center longitudinal axis of the modular unit 300. One, two or more sockets such as USB sockets 312 may be arranged on the side walls facing substantially perpendicularly with respect to the longitudinal direction. This simplifies construction and allows the cables entered into the sockets 312 to extend substantially in parallel to the surface on

which the modular unit is installed on. In some applications, it may be desirable to arrange the sockets 312 to face in a large angle, for example an angle of 10-45 degrees.

[0037] Figure 3b corresponds to a perspective view from a down-back angle of the modular unit 300. The bottom 330 comprises a lower surface 340, which may be flat.

[0038] The lower surface 340 may comprise one or more openings for ventilation such as slits, which may be arranged as parallel lines.

[0039] The head 320 may extend beyond the bottom 330 in the plane perpendicular to the longitudinal direction (illustrated). This allows a supporting surface 324, which may be flat, to be formed on the lower end of the head 320. The supporting surface 324 is adapted to abut the surface of the piece of furniture on which the modular unit 300 is installed. The head 320 may extend beyond the bottom 330 in the plane perpendicular to the longitudinal direction in 180 or more degrees or even substantially 360 degrees to form the supporting surface 324 around the whole perimeter of the head 320. The head 320 may comprise an interface 326 for attaching the modular unit 300 into a piece of furniture such as a desktop. The interface 326 may be arranged in the supporting surface 324 and it may comprise one or more openings for fasteners such as screws to be installed in. The interface 326 may be arranged for the attachment to be performed from above in the longitudinal direction. This may in many cases remove the need to turn the surface, on which the modular unit 300 is installed, around during installation.

[0040] The modular unit 300 comprises an inlet 302 for providing electricity into the modular unit 300 and an outlet 304 for distributing electricity from the modular unit 304. The inlet 302 and the outlet 304 may be housed in the bottom 330. The modular unit 300 also comprises a distributor (in Finnish: "haaroitin", not illustrated) which may be housed within the enclosure, for example within the bottom 330. The distributor provides the extension of the framed system between different modular units 300 while at the same time providing exit point from the framed system for an interface adapted to be connected by the appliances 130. Additionally, the modular unit 300 may comprise electrical circuitry for transforming the electricity distributed within the framed system into suitable form for the one or more interfaces 310, 312 or for a specific socket. This may include any combination of voltage, current and/or frequency conversion.

[0041] The inlet 302 and the outlet 304 may be arranged in parallel, for example on the back surface of the modular unit 300. They may also be electrically connected in parallel within the modular unit 300 so that each wire or pole connected to the inlet 302 is connected, e.g. with a direct connection, to a corresponding wire or pole at the outlet 304. The inlet 302 and the outlet 304 may be arranged as installation coupler interfaces. They may be arranged to be coupled with prefabricated cables with pluggable connectors each having one or more wires,

for example two, three or five wires. The cable may have a first connector adapted for the inlet 302 at one end and a second connector adapted for the outlet 304 at the other end. The inlet 302 and the outlet 304 may be correspondingly adapted for the cable connectors. One embodiment is illustrated in the figure but the function and construction of the inlet 302 and the outlet 304 may also be reversed. For example, the inlet 302 may be adapted for male connectors and the outlet 304 may be adapted for female connectors or vice versa, so that the inlet 302 may be adapted for female connectors and the outlet 304 may be adapted for male connectors. The modular unit 300 may comprise mechanical attachment interfaces to keep the connectors in place.

[0042] Figure 3c corresponds to a top-down view of the modular unit 300 according to an embodiment. The head 320 may be circular and it may comprise a circular cover 322, which may be removable as explained above. When the interface 310, 312 for providing electricity to appliances in the modular unit 300 comprises sockets, some or all of the sockets may be housed in the head 320.

[0043] The modular unit 300 may comprise one or more sockets 310, such as Schuko sockets. A socket 310 may comprise two openings for electric contacts. It may additionally comprise protective-earth contacts, which may be in form of clips. The socket 310 may output a voltage of for example 200-250 V, in particular 220-230 V. The socket 310 may also output currents for example up to 32 A, in particular of substantially 16 A. The socket 310 may output alternating current, for example with frequency of 50-100 Hz, in particular 50-60 Hz. The sockets may be arranged to face in a direction parallel to the longitudinal direction and when used particularly for Schuko sockets, this may allow providing a compact form of the modular unit 300.

[0044] The modular unit 300 may additionally or alternatively comprise one or more sockets 312, which may be USB sockets. The construction of the modular unit 300 allows USB sockets to be arranged to face in a direction parallel and/or perpendicular to the longitudinal direction. One, two or more USB sockets 312 may be installed on the side walls of the head 320, for example on the front side for easy accessibility, in one or more rows. Each USB socket 312 may be arranged to output a current of, for example 2,5 plus/minus 0,5 A.

[0045] In a specific example, the head 320 houses exactly one Schuko socket 310 facing in the longitudinal direction and one, two or more USB sockets 312

[0046] Figure 3d corresponds to a back view of the modular unit 300 according to an embodiment. The figure illustrates an example for how the modular unit 300 may comprise a head 320 above a bottom 330, which may be directly connected to each other. In particular, the figure illustrates an example of an inlet 302 and an outlet 304, which are arranged for the wide edge of the connector such as an installation coupler to be arranged along the longitudinal direction, the wide edge corresponding the direction on which the wires of the cable are arranged

side by side.

[0047] Any part of the enclosure of the modular unit 300 including the head 320 and/or the bottom may be made of plastic. The length of the modular unit 300 may vary and it may be, for example, 20 centimeters plus/minus 0-5 or 0-10 centimeters. The modular unit 300 may be adapted to operate with an input voltage of at least 100 V, for example 200-250 V or 220-230 V.

[0048] Fig. 4a illustrates a modular unit according to another embodiment from a perspective view. In the embodiment, the modular unit 300 is housed in two or more enclosures. For example, some or all of the interfaces for providing electricity to appliances may be housed in a first enclosure, while the inlet 302 and the outlet 304 may be housed in a second enclosure 400. A distributor of the modular unit 300 may be fully or partially housed within the second enclosure 400. The circuitries within the two or more enclosures may be connected with an electric cable 402. The length of the cable 402 between the enclosures may be adjusted based on the requirements of the installation and it can be, for example 5-100 centimeters but also less than 25 or 50 centimeters to avoid cable clutter. The first enclosure may comprise an opening 404 for the electric cable 402 for this purpose, for example in the bottom 330. The opening 404 may be located fully or partially at the lower surface 340 of the bottom 330, for example at the intersection of the lower surface 340 and the side walls of the bottom 330. The second enclosure 400 allows reducing the size of the enclosure housing the interface for providing electricity to appliances, for example when the modular unit 300 comprises only USB sockets.

Figs. 4b-c illustrate an enclosure 400 according to an embodiment. The enclosure 400 comprises an inlet 302 and/or an outlet 304 and may be used as the second enclosure 400 as described above. The enclosure 400 comprises a housing 410 which may be made of plastic, for example. The housing 410 can be made in one piece or in two or more pieces. In the latter case, the two or more pieces may be fastened to each other for example by separate fasteners such as screws or by a snap-on mechanism. Specifically for the latter purpose, the housing 410 may be made of flexible material. The enclosure 400 may be substantially rectangular, as illustrated in the figure. The inlet 302 and the outlet 304 may be installed in the opposite ends of the enclosure 400, for example along the longest axis of the enclosure 400, and they may face in opposite directions.

[0049] Within the enclosure 400, each of the inlet 302 and/or the outlet 304 may comprise contact points 420, 422 for wires. The contact points 420 may correspond to two, three or five wires, including neutral wire and one wire for single-phase current or three-wires for three-phase current. Optionally, a contact point for the wire for protective earth may be included as well. In the illustrated embodiment, the inlet 302 and the outlet comprise a contact point 420 for the neutral wire and a contact point 422 for the phased wire for single-phase current. The enclosure

400 may be adapted for the corresponding contact points 420, 422 at the inlet 302 and the outlet 304 to be connected with each other, for example by straight wires. A contact point 420, 422 may comprise one or more fasteners such as clamping screws for fastening the wires to the enclosure 400.

Figs. 5a-b illustrate modular units 300 according to two embodiments. Fig. 5a illustrates a modular unit 300 having USB sockets 312, e.g. two or more sockets, but no Schuko sockets as interfaces for providing electricity to appliances. An enclosure for housing the modular unit 300 can thus be made small, for example having a bottom 330 of diameter 55 millimeters plus/minus 0-5 millimeters. The modular unit 300 may comprise one or two enclosures so that the inlet 302 and/or the outlet 304 may be arranged in some cases in a second enclosure 400. Some or all of the USB sockets 312 may be arranged in a head 320 of the modular unit 300. Moreover, some or all of the USB sockets 312 may be arranged to face perpendicularly to the longitudinal direction.

[0050] Fig. 5a illustrates a modular unit 300 having USB sockets 312, e.g. two or more sockets, but no Schuko sockets, and wherein all of the USB sockets 312 are arranged to face along the longitudinal direction of the modular unit 300. This allows making the head 320 of the modular unit 300 relatively thin, e.g. 0.5-1.0 centimeters thick. Otherwise, what is said above in connection of the embodiment of Fig. 5a applies also here. For example, the bottom 330 can also in this embodiment be made small.

[0051] Fig. 6 illustrates a piece of furniture 600 with a modular unit 300 installed therein according to an embodiment. The piece of furniture 600 may be a work desk, a shelf, a board etc. It may comprise an opening such as a through-hole for accommodating the modular unit 300. The opening may be circular. The opening may be dimensioned to match the outer dimensions of the modular unit 300, for example the diameter of the bottom 330. The opening can also be made during installation, for example by boring. Alternatively or in addition, a separate mounting to support the modular unit 300 may also be included in the piece of furniture 600.

[0052] The piece of furniture 600 comprises an installation surface 610 such as a desktop to which the modular unit 300 may be installed. The installation surface 610 may be flat at least for the part which becomes in contact with the modular unit 300. The installation surface 610 may be thin enough, for example 5 centimeters or less, for the modular unit 300 to extend on both sides of the installation surface 610. For example, the modular unit 300 may comprise a head 320 which remains on top of the installation surface 610 and a bottom 330 extending below the installation surface 610. The head 320 may be arranged to abut directly on the installation surface 610. The inlet and/or the outlet of the modular unit 300 may be positioned below the installation surface 610 allowing any cables connected to them to be routed below the installation surface 610.

[0053] The modular unit 300 may be installed on the installation surface 610 vertically, i.e., the longitudinal direction of the modular unit 300 substantially aligning with the direction of gravity. Also other arrangements are possible. The modular unit 300 may be installed so that it is kept in place by means of friction and/or gravitation or it may be installed by attaching it to the installation surface 610, for example by fasteners such as one or more screws. For this purpose, the modular unit 300 may be opened so that the fasteners are installed within the modular unit 300 and covered afterwards. This allows any fasteners to be hidden from view after installation. The fasteners may be introduced into the modular unit 300 from above so that the installation surface 610 may remain in place during or after installation and it need not be turned around. In many situations, this may notable speed up and simplify installation.

[0054] Once the modular unit 300 has been installed on the piece of furniture 600, it may be connected to one or more other modular units 300. Two, three, four or more modular units may be connected in a chain so that when a modular unit 300 at one end of the chain is connected to an external power source, the power is distributed to the other modular units 300 as well. The modular units 300 may be connected together to form a framed system and the system may be used to provide work desk electrification. This allows modularly providing electric outlets at pieces of furniture including work desks.

[0055] The present disclosure allows integrating the whole circuitry required to both distribute electricity between modular units and provide electricity to appliances into one or two small enclosures. This includes the inlet, the outlet, the distributor and the interface for providing electricity to appliances. Some or all connection interfaces for the modular unit may be arranged along the surface of the one or more enclosures. The modular unit specifically allows providing charging points for mobile devices such as mobile phones, laptops and tablets. It may specifically be used in an office adapted for mobile-device use. The modular units may be adapted to distribute only electricity so that while the units provide socket connectivity, e.g. USB sockets, the sockets are specifically adapted for charging or providing electricity and not for data transfer.

[0056] The different functions discussed herein may be performed in a different order and/or concurrently with each other.

[0057] Any range or device value given herein may be extended or altered without losing the effect sought, unless indicated otherwise. Also any embodiment may be combined with another embodiment unless explicitly disallowed.

[0058] Although the subject matter has been described in language specific to structural features and/or acts, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to the specific features or acts described above. Rather, the specific features and acts described above are disclosed as ex-

amples of implementing the claims and other equivalent features and acts are intended to be within the scope of the claims.

[0059] It will be understood that the benefits and advantages described above may relate to one embodiment or may relate to several embodiments. The embodiments are not limited to those that solve any or all of the stated problems or those that have any or all of the stated benefits and advantages. It will further be understood that reference to 'an' item may refer to one or more of those items.

[0060] The term 'comprising' is used herein to mean including the method, blocks or elements identified, but that such blocks or elements do not comprise an exclusive list and a method or apparatus may contain additional blocks or elements.

[0061] It will be understood that the above description is given by way of example only and that various modifications may be made by those skilled in the art. The above specification, examples and data provide a complete description of the structure and use of exemplary embodiments. Although various embodiments have been described above with a certain degree of particularity, or with reference to one or more individual embodiments, those skilled in the art could make numerous alterations to the disclosed embodiments without departing from the spirit or scope of this specification.

Claims

1. A modular unit (300) for work desk electrification, comprising:
 - an inlet (302) for providing electricity into the modular unit (300); and
 - at least one interface (310, 312) for providing electricity to appliances (130); **characterized by**
 - an outlet (304) for distributing electricity from the modular unit (300); wherein the modular unit (300) is adapted for modular connectivity with at least two like modular units (300) using electric cables adapted for pluggable connection with the inlet (302) and the outlet (304).
2. A modular unit (300) according to claim 1, wherein the inlet (302) and the outlet (304) are arranged as installation coupler interfaces.
3. A modular unit (300) according to any of the preceding claims, wherein the inlet (302) and outlet (304) are connected in parallel within the modular unit (300).
4. A modular unit (300) according to any of the preceding claims, wherein the at least one interface (310, 312) comprises a USB socket (312) and/or a Schuko

socket (310).

5. A modular unit (300) according to any of the preceding claims, wherein the at least one interface (310, 312) comprises a Schuko socket (310) or a USB socket (312) arranged to face in the longitudinal direction of the modular unit (300) or a USB socket (312) arranged to face perpendicularly with respect to the longitudinal direction of the modular unit (300). 5
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6. A modular unit (300) according to any of the preceding claims, wherein the modular unit (300) is adapted for attachment on a desktop (610) from above.
7. A modular unit (300) according to any of the preceding claims, comprising an enclosure with a head (320) housing the at least one interface (310, 312) and a bottom (330) housing the inlet (302) and the outlet (304); and wherein the modular unit (300) is arranged for the head (320) to be abutted on a desktop (610) while the bottom (330) is positioned below the desktop (610). 15
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8. A modular unit (300) according to any of the preceding claims, wherein the modular unit (300) comprises a head (320) and/or bottom (330) having a circular cross section. 25
9. A modular unit (300) according to any of the preceding claims, wherein the modular unit (300) houses a circuit board arranged along the longitudinal direction of the modular unit (300). 30
10. A modular unit (300) according to any of the preceding claims, comprising a first enclosure housing the at least one interface (310, 312), a second enclosure (400) housing the inlet (302) and the outlet (304) and an electric cable (402) situated between the first and the second enclosure (400). 35
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11. A desktop (610) comprising the modular unit (300) of any of the preceding claims.
12. Use of one or more modular units (300) according to any of claims 1-10 for work desk electrification. 45
13. A system for work desk electrification, comprising two or more modular units (300) according to any of claims 1-10 and one or more electric cables connecting the two or more modular units (300) in a chain formation. 50
14. A method for work desk electrification, comprising installing two or more modular units (300) according to any of claims 1-10 to one or more work desks (610) and connecting the two or more modular units (300) in a chain formation using one or more electric cables. 55

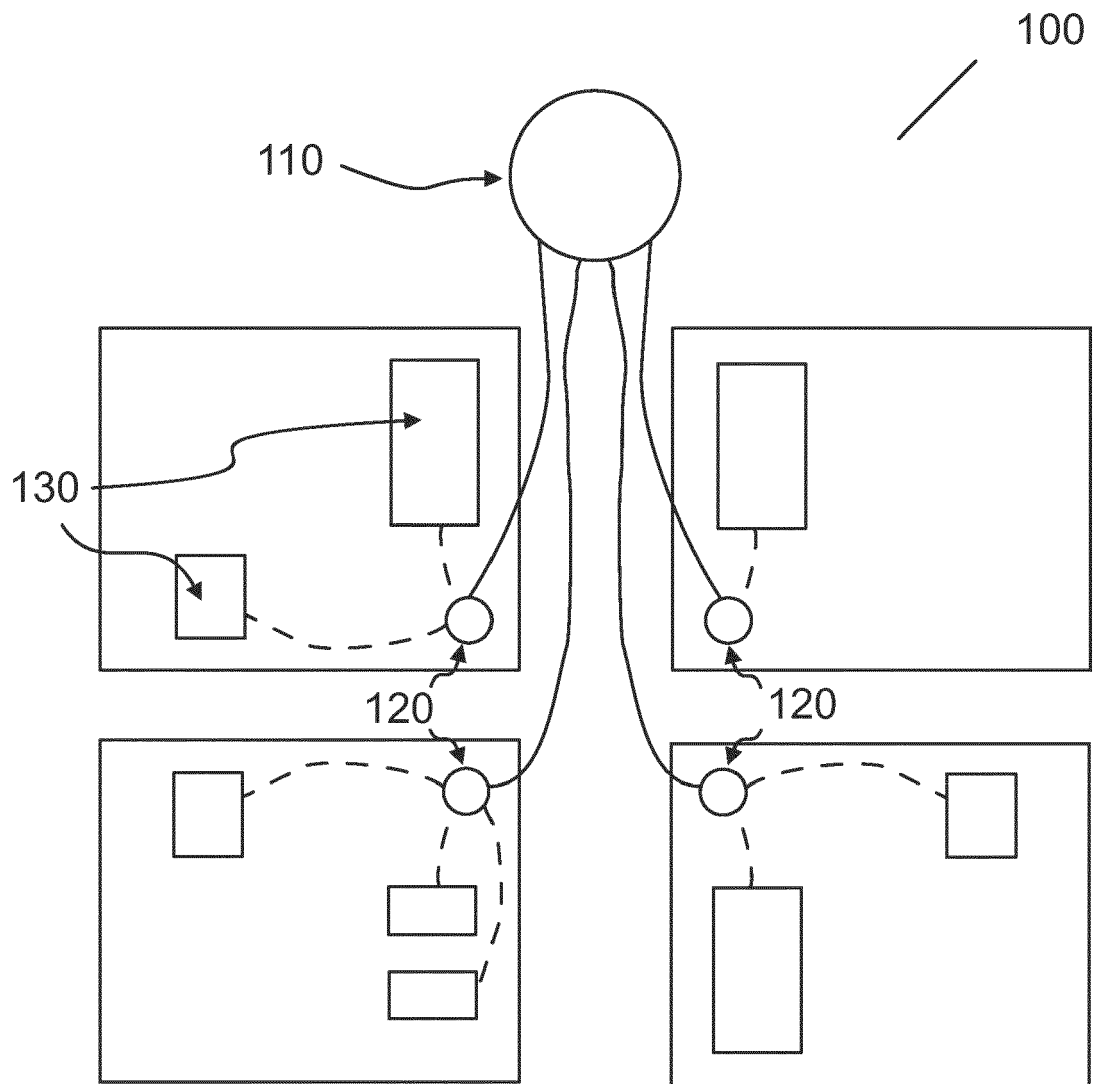


FIG. 1

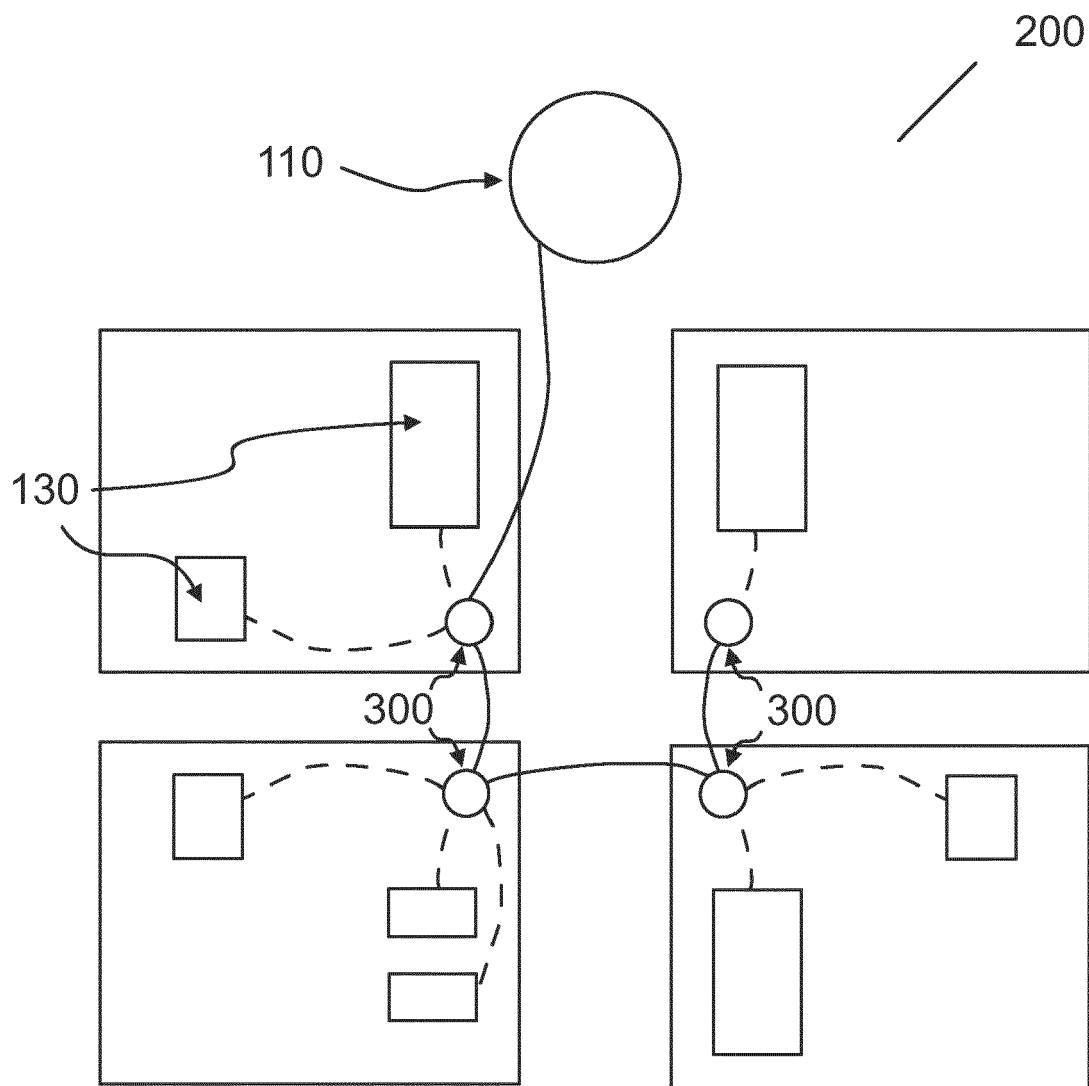


FIG. 2

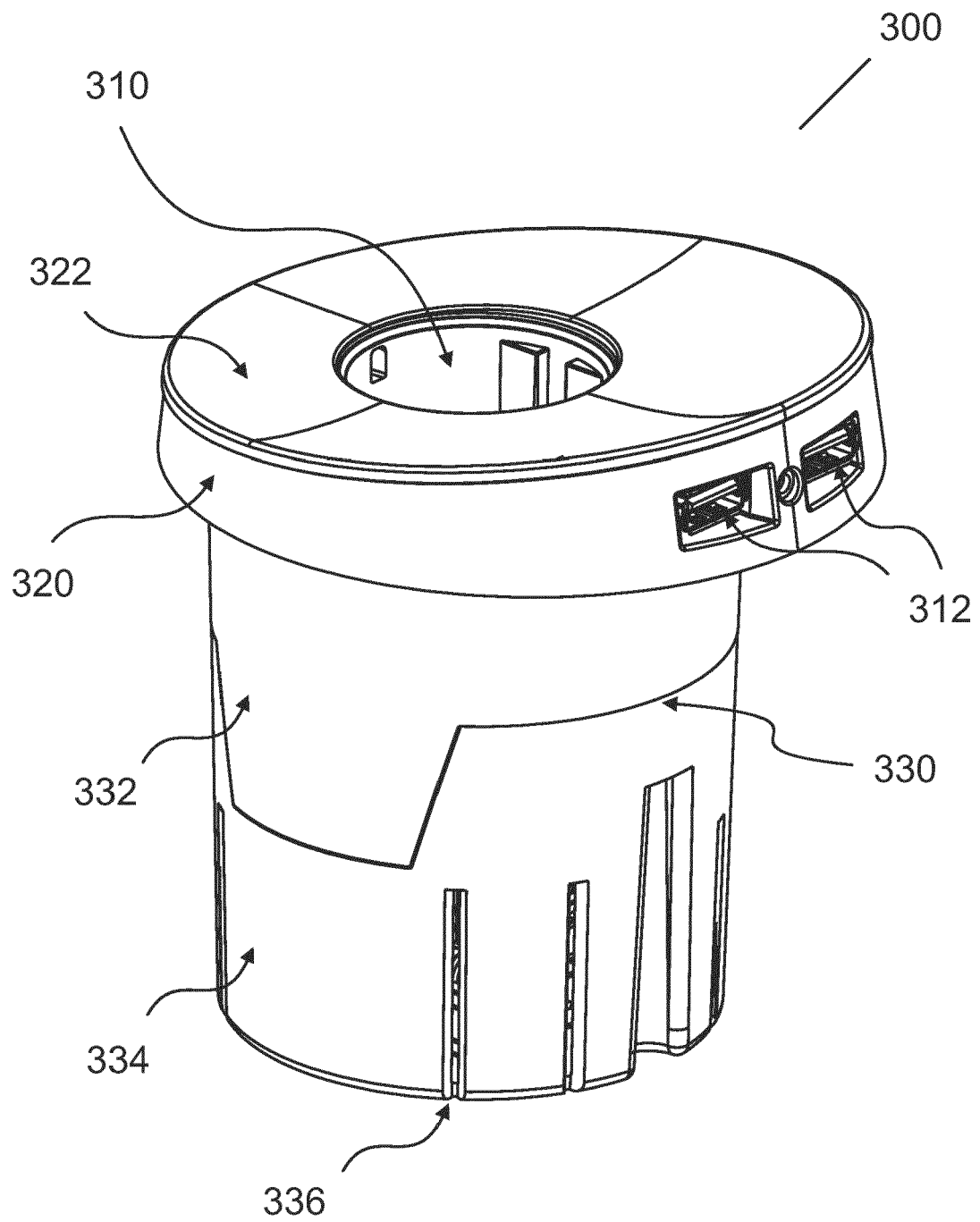


FIG. 3a

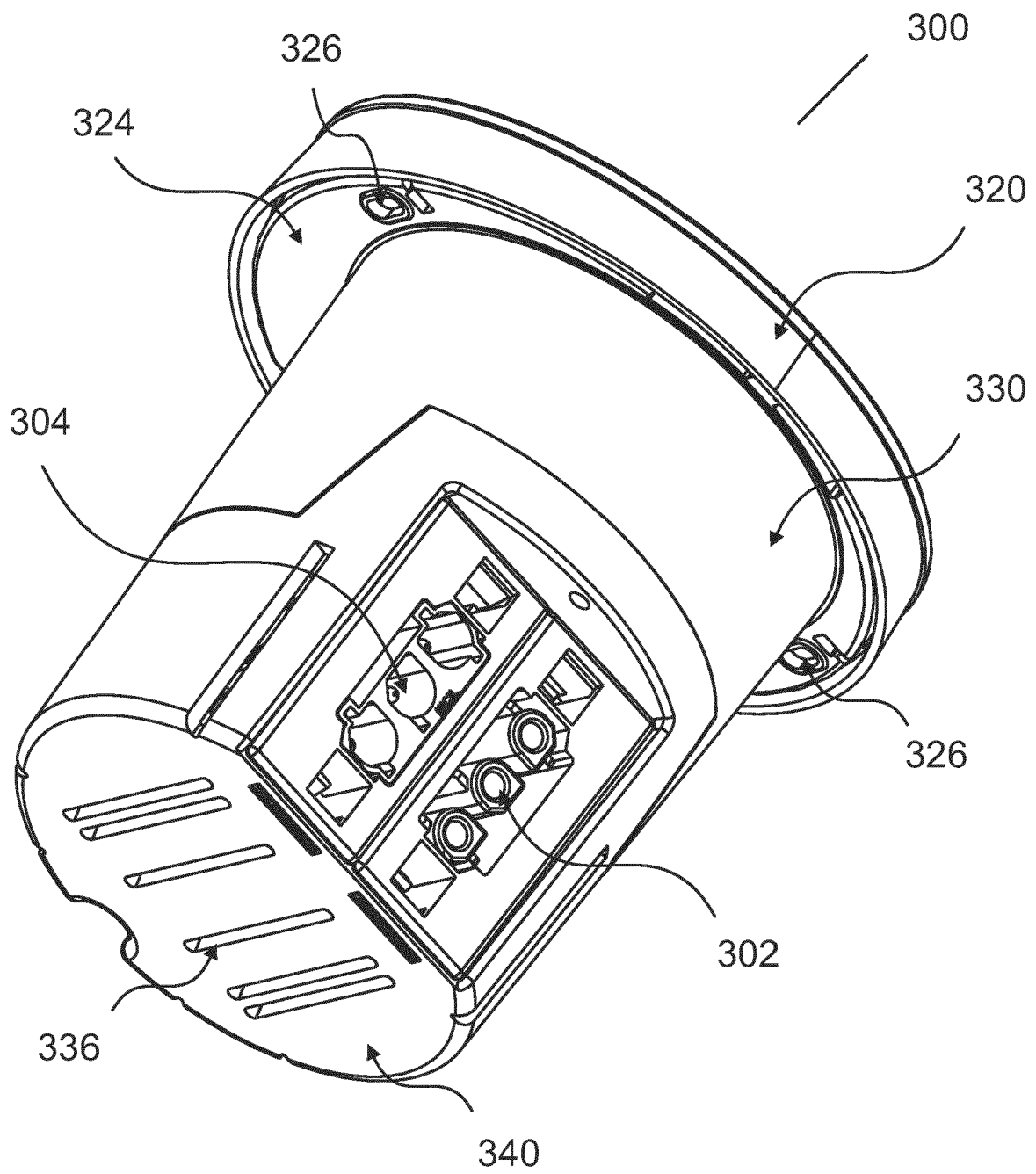


FIG. 3b

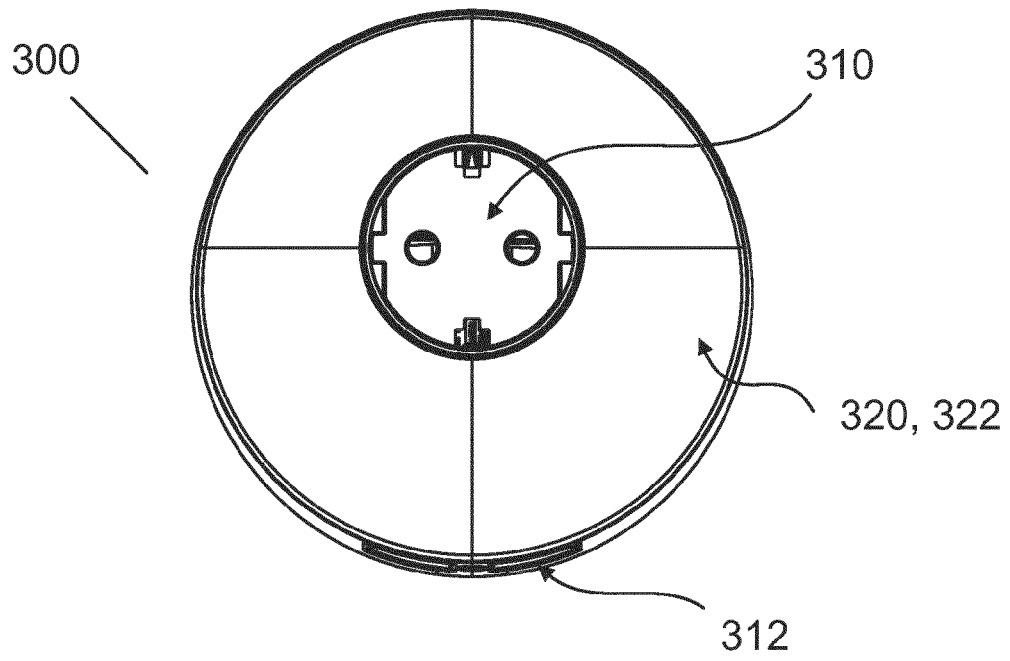


FIG. 3c

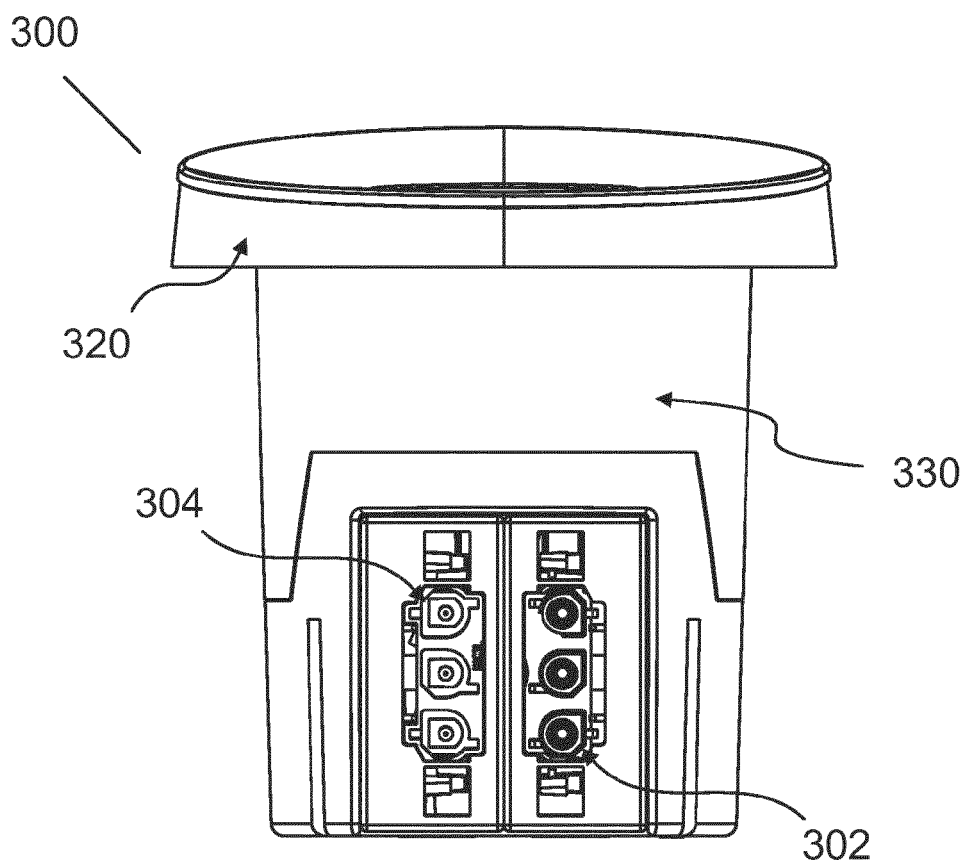


FIG. 3d

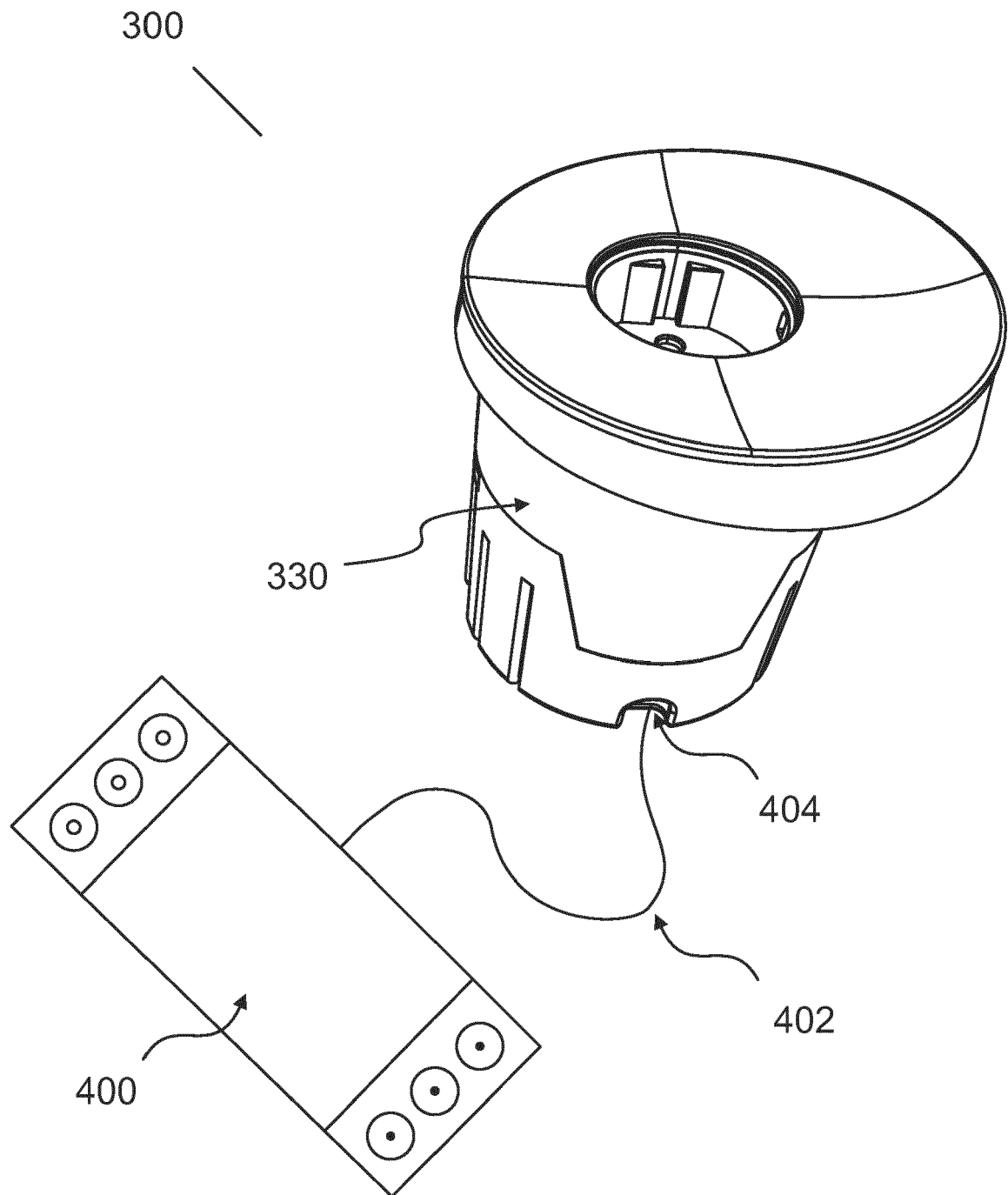


FIG. 4a

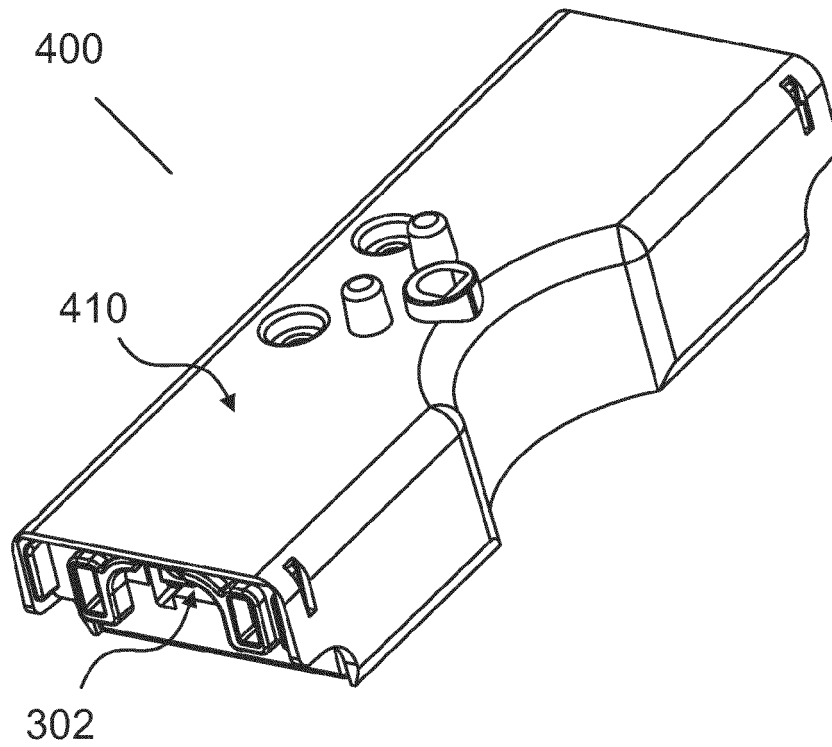


FIG. 4b

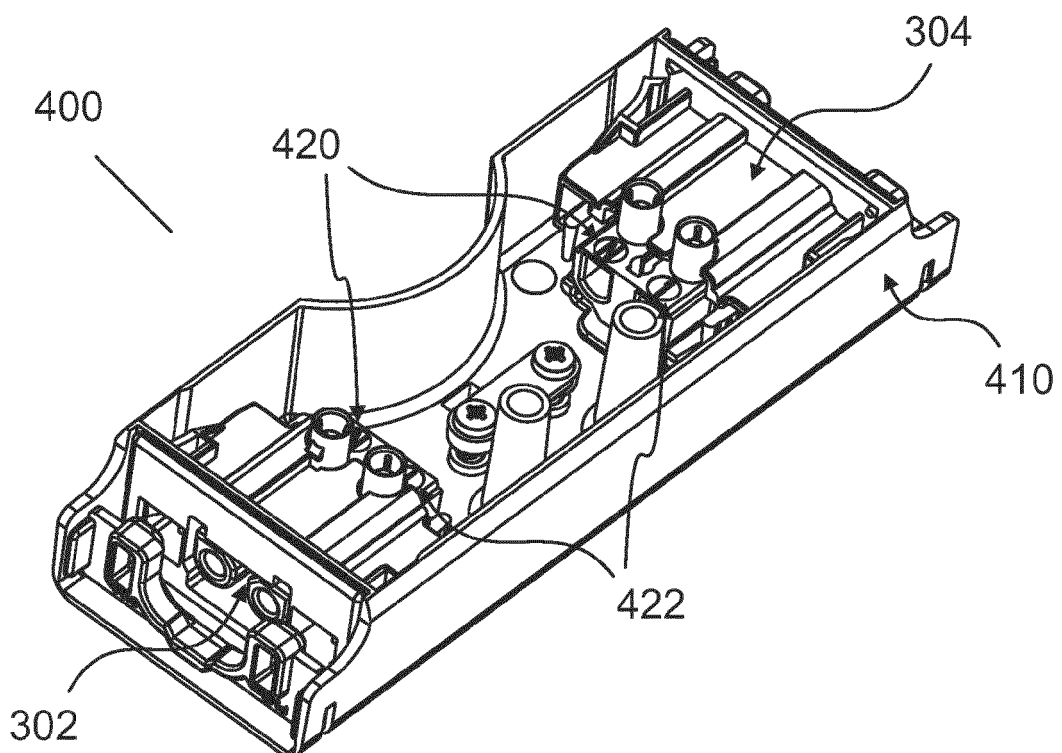


FIG. 4c

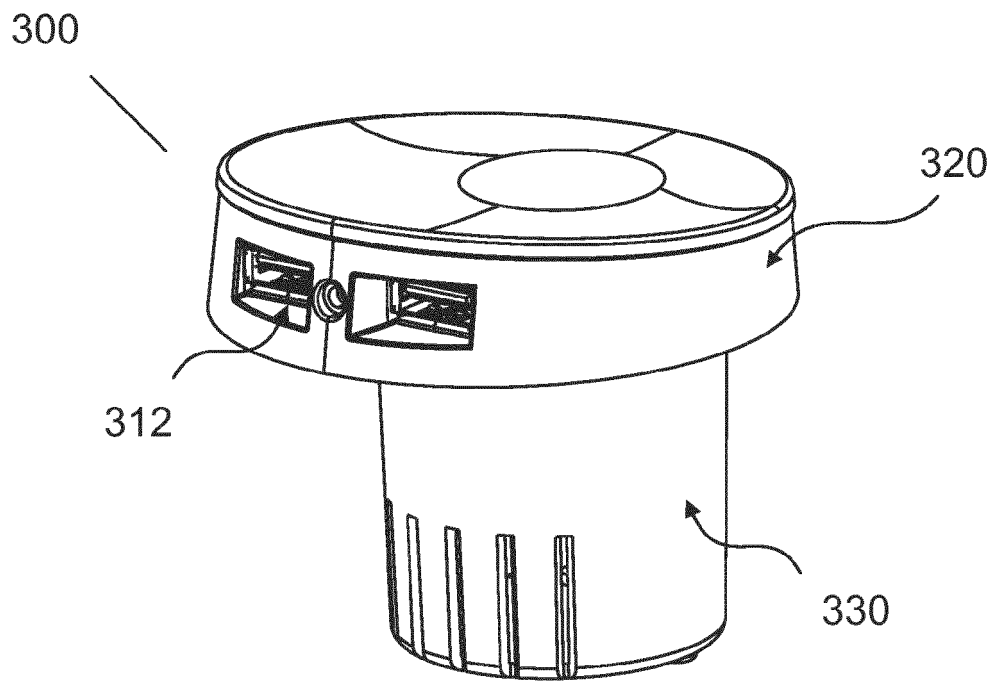


FIG. 5a

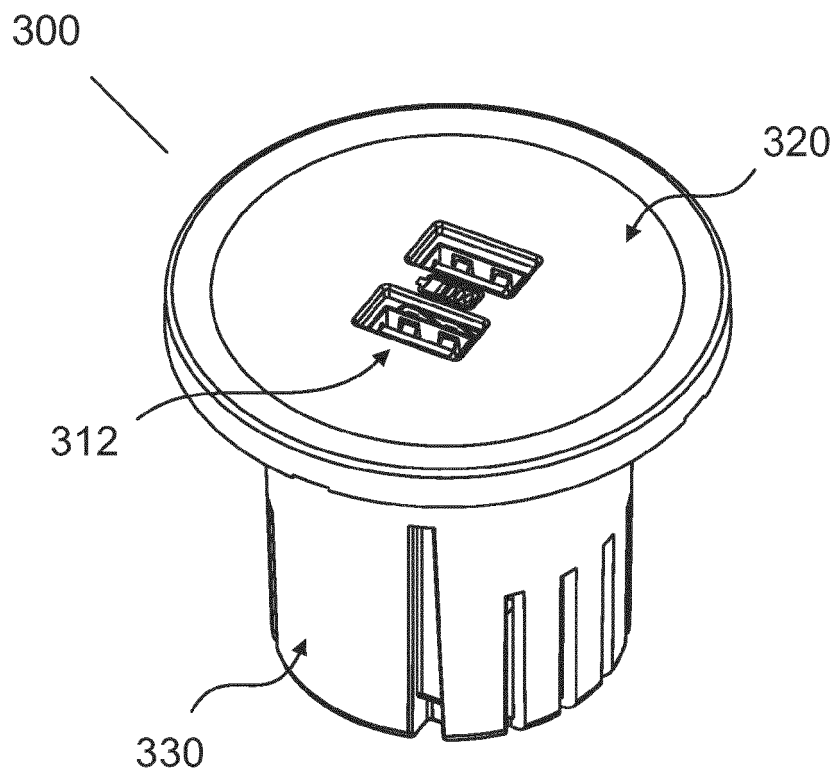


FIG. 5b

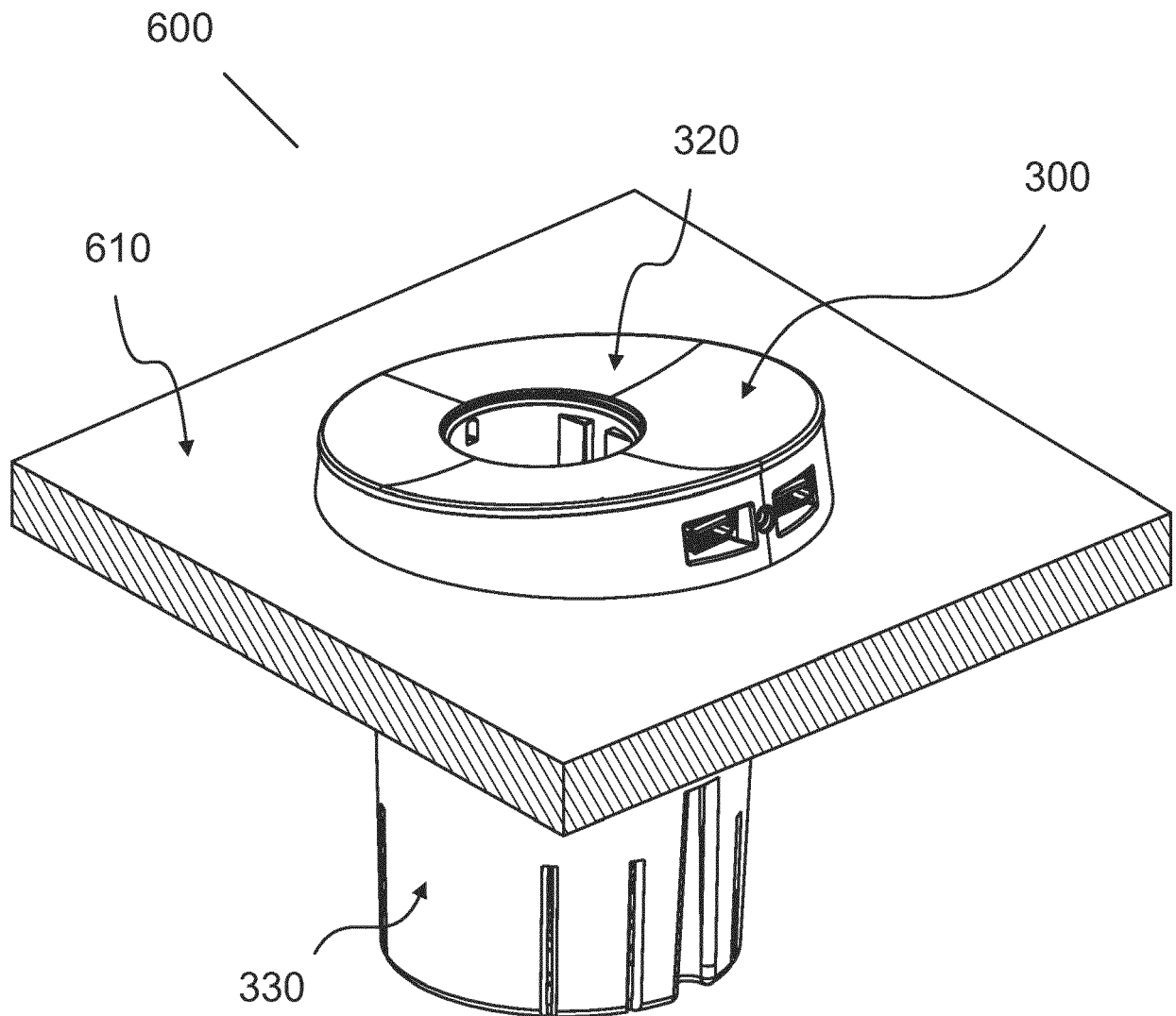


FIG. 6



EUROPEAN SEARCH REPORT

Application Number
EP 19 15 3958

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 6 830 468 B2 (USM HOLDING AG [CH]) 14 December 2004 (2004-12-14) * figures 4, 6 *	1-5,8-14	INV. A47B21/06
X	US 2012/261988 A1 (BYRNE NORMAN R [US] ET AL) 18 October 2012 (2012-10-18) * figures 1-8 *	1,2,4-7, 11-14	
X	US 5 967 820 A (SIEGAL BURTON L [US] ET AL) 19 October 1999 (1999-10-19) * figures 1-14 *	1,2,4,5, 12-14	
X	US 2015/255981 A1 (BYRNE NORMAN R [US] ET AL) 10 September 2015 (2015-09-10) * figures 1-5 *	1,2, 12-14	
X	WO 2008/154776 A1 (ST & T ELECTRIC CORP [CN]; LI TONY [CN]) 24 December 2008 (2008-12-24) * figures 1-7 *	1,2	
A	GB 2 524 164 A (OE ELECTRICS LTD [GB]) 16 September 2015 (2015-09-16) * figure 2 *	8	TECHNICAL FIELDS SEARCHED (IPC) A47B H01R H02G H02J
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 9 April 2019	Examiner Ibarrondo, Borja
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 19 15 3958

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6830468 B2	14-12-2004	AT 244947 T	15-07-2003
		AT 269597 T	15-07-2004
		AU 5208801 A	26-11-2001
		BR 0110894 A	11-03-2003
		CZ 20023392 A3	18-06-2003
		DE 50002826 D1	14-08-2003
		DE 50102605 D1	22-07-2004
		DK 1156569 T3	18-08-2003
		DK 1282929 T3	19-07-2004
		EP 1156569 A1	21-11-2001
		EP 1282929 A1	12-02-2003
		ES 2170037 T1	01-08-2002
		ES 2220763 T3	16-12-2004
		HK 1049408 A1	10-12-2004
		HU 0301872 A2	29-09-2003
		JP 2003533312 A	11-11-2003
		MX PA02011377 A	12-08-2004
		PL 357047 A1	12-07-2004
		PT 1156569 E	28-11-2003
		PT 1282929 E	30-11-2004
		TR 200401485 T4	23-08-2004
		US 2003171017 A1	11-09-2003
		WO 0189050 A1	22-11-2001
US 2012261988 A1	18-10-2012	CA 2774364 A1	18-10-2012
		US 2012261988 A1	18-10-2012
		US 2013119772 A1	16-05-2013
US 5967820 A	19-10-1999	CA 2265393 A1	07-10-1999
		US 5967820 A	19-10-1999
US 2015255981 A1	10-09-2015	CA 2883970 A1	04-09-2015
		MX 355902 B	03-05-2018
		US 2015255981 A1	10-09-2015
WO 2008154776 A1	24-12-2008	DE 212007000099 U1	07-01-2010
		WO 2008154776 A1	24-12-2008
GB 2524164 A	16-09-2015	AU 2015100149 A4	19-03-2015
		AU 2015101842 A4	04-02-2016
		GB 2524164 A	16-09-2015

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82